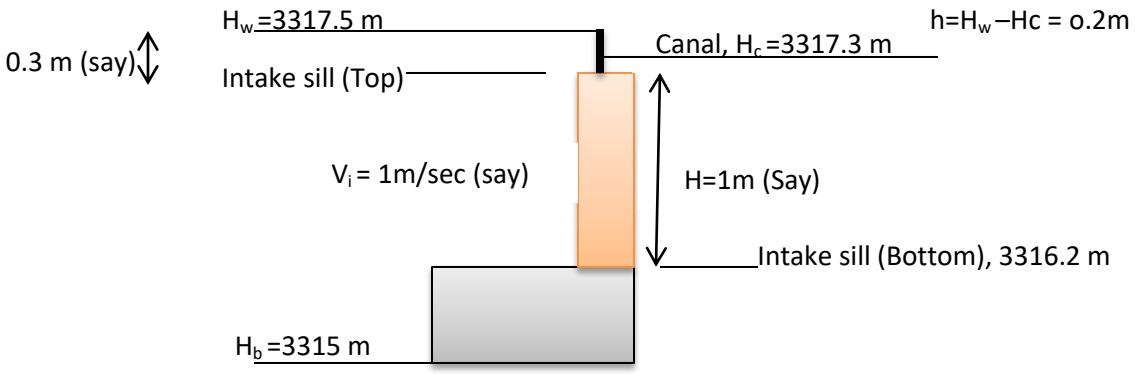
1. **Design side intake with coarse trash rack for a project.**
   River bed level = 3315 masl
   Weir crest (Normal water) level = 3317.5 masl
   Canal water level = 3317.3 masl
   Turbine discharge = 1.45 m3/sec. Assume other suitable data for design.
   Solution:

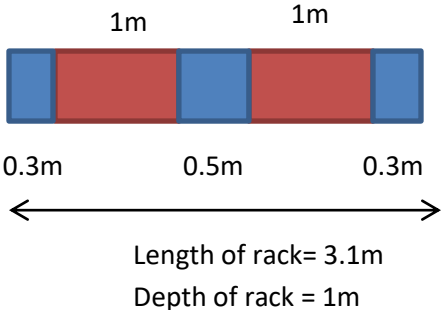


- Intake discharge (Q_i) = 1.2*1.45 = 1.74 m^3/sec

X-sectional area of intake (A) = Q_i /V_i = 1.74 m^2, Width of intake (B) = A/H = 1.74 m

Hence, adopt 1m width by 1m depth intake having 2 numbers of openings.

- Check :
  Q = c_d A V = 0.6 * (2*(1*1)) * √ (2 g h) = 2.38 m^3/sec > 1.74 m^3/sec (OK)
- Design of trash rack:
  Trash rack opening (b) = 100 mm (say), Thickness of bar (t) = 20 mm (say)
  Angle of inclination with horizontal (ϕ) = 70° (Range 50° - 80°)



So, Gross submerged area of trash rack = (3.1*1)/sin70°= 3.29 m^2

% opening = 100/(100+20) = 83.33%

So, effective opening area of trash rack (A_{eff}) = 0.8333 * 3.29 = 2.74 m^2

Hence, approach velocity in trash rack (V_0) = Q/A_{eff} = 0.635 m/sec (within the limit of 0.6-0.75 m/sec) (OK)

(i) Contraction Loss (hl_c) = K v_0^2/2g =0. 62 mm, K= 0.03 for bell mouthed.

(ii) Rack losses (hl_r) = k_r $(t/b)^{4/3}$ (V_0^2/2g) sin ϕ = 5.43 mm, K_r = 2.42 for rectangular bar

- Minimum submergence (s):

$\frac{s}{v\sqrt{d}} \geq 0.3$, Take d= depth of intake = 1 m, velocity of flow into conduit = 1m/sec

So, s = 0.3m.